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DEFENSE SYSTEMS MANAGEMENT SCHOOL



PROGRAM MANAGEMENT COURSE INDIVIDUAL STUDY PROGRAM

APPROACHES TO SOLVING GFE DILEMMAS
IN NAVY SHIPBUILDING CONTRACTS

Study Project Report
PMC 76-1

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by

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EXECUTIVE SUMMARY

Government-furnished equipments (GFE) are the cause of many cost and schedule problems experienced by the military program managers. This study addresses some of the typical problems encountered in the past by Navy program managers and offers some approaches which show promise of eliminating or reducing these problems.

The study addresses why GFE is used; the obligation of the government when GFE is used; the ASPR policy in regards to GFE; problems associated with responsibility and authority when GFE is procured by functional managers in a matrix organization; recent recognition by OSD of the GFE problem; and offers some approaches which show promise to eliminate or reduce the problems associated with GFE.

While the study concentrated on problems encountered by the Navy in shipbuilding programs as the source, many of these same problems are commonly experienced by military program managers of all the services, and the proposed approaches which may reduce these problems have application in programs other than Navy shipbuilding.

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SECTION I

INTRODUCTION

Purpose of the Study Project

Government-Furnished Equipment (GFE) is the cause of many cost and schedule problems experienced by military program managers. This study addresses some of the typical problems encountered in the past by Navy program managers in the execution of shipbuilding programs and offers, for the purpose of promulgation, some approaches which show promise of reducing or eliminating these problems.

While the study concentrated on problems encountered by the Navy in shipbuilding programs as the source, many of these same problems are commonly experienced by military program managers of all the services and the proposed approaches which may reduce these problems have application in programs other than Navy shipbuilding.

Background

Sometimes it is in the best interests of the government to have the military program manager furnish equipment to the contractor for subsequent installation or integration into the item being procured. Under this concept the equipment provided is referred to as Government-Furnished Equipment (GFE).

Usually there is technical information which describes the equipment to be furnished that is also provided to the contractor and this is called Government-Furnished Information (GFI). GFE and GFI are notorious for the schedule and cost problems they generate. If they are not furnished to the contractor when promised, or are defective, the government is responsible for any consequent delay or additional costs incurred by the contractor. In many cases a contractor can shield his own cost and schedule problems by attributing them to defective or late GFE or GFI. As a result, problems associated with GFE or GFI are a frequent source of claims by contractors against the government.

Seldom, if ever, is there a program in which a single contractor furnishes the complete weapon system. Usually there are several contractors whose products flow to the prime system integration contractor along with other items furnished by the government. In many cases major sub-systems of the complete weapon system are assemblies of components, some furnished by the sub-system contractor and some received by the sub-system contractor to be joined with what he is furnishing.

The crucial distinction between government-furnished and contractor furnished equipment is that the government assumes a responsibility for the proper functioning and on-time delivery of government-furnished items. The contractor assumes this responsibility for items he furnishes, including items

obtained from his subcontractors.

From the program manager's viewpoint, there are two kinds of GFE/GFI. In one case, there are items needed by his system prime contractor from another contractor and the program manager has direct control over both contractors. In another case, there are items needed by one of his contractors from a source not under the program manager's direct control. A different organizational element may be responsible, or perhaps a different service.¹

There are problems of coordination to ensure adequate cost, schedule and performance control with both kinds, but they are more severe with items (and especially development items) not under the direct control of the program office. Navy shipbuilding program management offices utilize the functionally oriented (matrix) form of organization. GFE is procured and controlled by the functional organization which makes possible greater specialization with less technical duplication.

Another benefit is the fact that functional organizations are usually established for indefinite periods, whereas a program office is disestablished upon completion of the program. Thus, for continuity of effort and the accumulation of expertise the functional form of organization serves another valuable purpose.

However, this form of organization for procuring and controlling GFE brings with it coordination and communication

problems for the program manager. The program manager is super-imposed upon the functional organization, creating complex relationships. While the program manager has the responsibility for organizing and controlling all activities involved in achieving the ultimate objective of completing the shipbuilding program within cost, on schedule, and which meets the parameters of the specifications, his formal authority and control in the area of GFE is diluted.

In this situation the Navy program manager cannot operate effectively if he relies solely on the formal authority of his position. Success is more likely to depend on his ability to influence the functional organization members. Because he is the focal point in the operation he does have informational and communication inputs which provide him with a strong basis of influence.² "One of the project managers greatest sources of authority involves the manner in which he builds alliances in his environment--with his peers, associates, superiors, subordinates, and other interested parties. The building of alliances supplements his legal authority; it is the process through which the project manager can translate disagreement and conflict into authority (or influence power) to make his decisions stand."³

Recent Recognition by OSD of the GFE Problem

The following comments were made by the Honorable William P. Clements, Deputy Secretary of Defense, in a memo for the

Secretary of the Navy, dated 20 January 1976:

"I would like the Navy to take steps to increase the management emphasis devoted to GFE, including cost estimation, procurement management and management information systems and revision of program manager charters to improve their control with respect to GFE."⁴

These remarks show a concern at the OSD level for the need to improve the management of GFE and a concern on the dichotomy of responsibility and authority associated with GFE under the functional form of management. While there are definite actions that can be taken to increase the management emphasis devoted to GFE and the potential to establish procedures to improve the control of GFE by the program manager, the revision of charters to improve the program manager's authority presents a dilemma. While the present situation of having the program manager responsible for the outcome of all matters concerning GFE for his program without the requisite authority is undesirable, the alternative brings with it undesirable factors such as the duplication within each program management office the technical expertise now contained in a single functional organization.

This dilemma is common to all organizations employing a program management organization system superimposed upon a functional organization system, and much has been written on this topic in various textbooks on management. This paper will not attempt to offer solutions for this dilemma, but will

address in Section III some approaches which allow the program manager the control necessary to reduce the risks associated with GFE, regardless of who has the primary authority and control of the GFE.

Obligation of the Government when Government
Furnished Equipment is Used

The government assumes an extensive contractual obligation when it undertakes to furnish material to contractors for use in the fabrication of, or to be delivered as a component of the end item.⁵ This is particularly true of material or components which must be installed within a specific period during the contract period. The obligation normally includes:

- (1) Proper identification of material and technical documentation to be provided to the contractor.
- (2) A warranty by the government that the material is suitable for its intended use and will be delivered by the time set forth in the contract schedule.
- (3) Delivery of the material and documentation in accordance with the warranty in (2) above, to avoid delay and disruption claims and with delivery of certain types of documentation, such as installation drawings in advance of material delivery.
- (4) The furnishing of material which conforms to the total system requirements as detailed in the

specifications and associated drawings.

ASPR Policy in Regards to GFE

The Armed Services Procurement regulations discourage the use of Government Furnished Equipment by program managers. ASPR Section 13-201 sets forth the policy for furnishing equipment by the government to a contractor as follows:

"It is the general policy of the Department of Defense that contractors will furnish all material required for the performance of government contracts. However, the government should furnish material to a contractor when it is determined to be in the best interest of the government by reason of economy, standardization, the expediting of production, or other appropriate circumstances."

Why GFE is Used

Some examples of cases where the Navy deems it is in the best interest of the government to furnish equipments to a contractor are enumerated below:⁵

a. Developmental. This category includes equipment in a research and development status, which has no prior naval ship-board operational experience, and material with nondefinitive specifications that must be procured and/or developed concurrently with the ship. Materials in this category shall be specified only when essential to satisfy an operational or ship characteristics requirement which cannot be satisfied by existing equipments.

b. Complex Materials. This category includes equipments of such complexity that the Government must be responsible for exercising direct surveillance over the various phases of their procurement and manufacture. Also included in this category are equipment incorporating technological advances which are beyond the state of the art for the shipbuilding industry.

c. Long Lead Time Items. The production lead times of equipments in this category are of such length as to control the ship completion dates, thus procurement action must be started prior to award of the ship contract if the ship is to be delivered on a reasonable schedule. Some of these items may require

procurement in advance of the program year of the ship and these require special authority to procure, in accordance with NAVMAT INSTRUCTION P7102.1B of 24 September 1970. Where appropriate and practicable, contractual arrangement should be made to transfer a Government prime contract for long lead time items to the shipbuilder(s) as part of the award of the shipbuilding or conversion contract(s). Techniques by which long lead time equipment can be authorized for procurement by shipbuilders should be considered prior to a determination to make long lead time material Government furnished.

d. U. S. Government Stock in Long Supply. When an item required in a shipbuilding contract is in Government stock, in long supply, such a stock item may be furnished as a Government Furnished Equipment as a means of reducing the stock on hand. In such cases, the activity recommending that the item be made GFE shall advise the PM who shall ensure that the procurement activity is made aware of the reason for the demand so that the effort to reduce stock will not result in a replenishment order which will return the stock to its previous long supply status. This category shall be used sparingly and only when it is determined that such stock still meets specification requirements and the cost savings are real and clearly outweigh the Government's obligations with respect to GFE.

e. Single Source Items for Small Ships and Craft. This category includes those noncomplex items that can be obtained from only one source, are made especially for the Navy, and are a major component in small ships and craft.

f. Outfit Supply. This category includes items which are standard stock items of a portable nature not requiring installation by the shipbuilder. Such items normally are assembled by the outfit supply activity. They shall be included in the list of Government Furnished Equipment contained in the contract (Schedule A) only if the materials are called for in the ship specifications, or are scheduled for stowage by the shipbuilder. They must be, however, specifically identified.

g. Standardization. The standardization policy objective is to achieve intra-Navy, intra-class and intra-ship standardization of material. However, material should not be made GFE for the sole purpose of achieving such standardization. If equipment is to be Government Furnished for reasons other than intra-Navy standardization, equipment performing similar functions should be made identical for all ships of a class. To accomplish this, multi-year procurements of such material should be directed by the PM. If this is not feasible, then a Class D and F for the standardization of material should be

obtained. To the degree possible, all Government Furnished Equipment should be identical with material already supported in the Navy Supply System.

h. Economical Buys. Material can be made GFE where it can be demonstrated that over-all savings to the Government will accrue through quantity procurement, considering all factors, including Government storage, handling and shipping costs, insurance costs and other risk assumptions by the Government.

SECTION II

REVIEW OF PROBLEMS

Present Situation

From 1967 to the end of June 1975, shipbuilders have submitted to the Navy a total of \$1.6 billion in claims.⁶ The GAO has identified GFE and GFI to be among the major factors which have contributed to these claims. These factors are as follows:

- (1) Late and inaccurate lead-yard working plans.
- (2) Inadequate specifications.
- (3) Defective and late delivery of Government-Furnished Equipment and technical information.

Late and inaccurate lead-yard working plans:

Often ships of the same class are constructed by more than one shipbuilder. In these circumstances one shipbuilder, called the lead-yard, is selected to construct the first ship of the class; that shipbuilder provides the detailed working plans to other shipbuilders, called follow-yards. If the working plans are inaccurate, the contractor must revise the plans before proceeding with construction. Late working plans can delay and obstruct construction effort. In either case, the contractor may incur increased costs.

Inadequate specifications:

Specifications contain detail technical requirements for ship construction and describe details concerning equipment to be installed. Defective or misleading Navy specifications have been a continuing factor in shipbuilders' claim submissions. According to shipbuilders, defective specifications resulted in additional costs because new specifications had to be prepared to replace defective ones. This took more time and cost more money than was originally estimated. Contractors allege they have had to rip out and redo completed work found to be unacceptable because of defects in specifications.

Defective and late delivery of Government-furnished equipment and technical information:

In its shipbuilding contracts the Navy agrees to provide the contractor with various equipment for installation on ships when this is deemed to be in the best interest of the Government. When equipment or technical information is delivered late, shipbuilders' construction schedules and delivery dates may be affected. By the same token, when equipment is defective rework is required which, in turn, interrupts the shipbuilders' schedules for fabricating and installing supporting structures and service systems for the equipment.

Classification of the major causes of Problems associated with GFE/GFI:

1. Late deliveries of GFE or GFI to contractor results in a claim for delay and disruption.

2. GFI delivered to contractor, which is needed for preventative maintenance, installation and testing, is incomplete or inaccurate.
3. GFE delivered to contractor is defective due to lack of quality control at equipment manufacturer's facilities, improper packing, rough handling in shipment, improper storage, improper testing, or improper installation.
4. Changes in contract delivery schedules (i.e., slip in schedules) causes an extended storage of equipment with subsequent degradation due to environmental conditions, pilferage or cannibalization.
5. Government allows contractor to slip delivery of end item, but does not attempt to receive a corresponding slip in delivery date for the GFE.
6. The warranty paid for by the Government in equipment contract prices is not used to advantage due to:
 - (a) No testing performed upon receipt to identify malfunctions.
 - (b) Expiration of the warranty occurs prior to equipment installation and/or initial testing.
7. Present requirements for the care of stored GFM are too vague and afford the contractor wide latitude in the "reasonable interpretation" of required care. Similar conditions exist in regard to the period after equipment installation.

8. The identification of the equipment itself, or the necessity for, and timeliness of performance of preventative maintenance or testing can not be determined, upon receipt of GFE from the requirement for packing or marking information on the external containers.
9. Equipments are delivered without the necessary repair parts needed for testing or installation which leads to cannibalization of other equipments on hand and subsequent delay and disruption claims from the contractor.
10. Equipments are not modified prior to shipment to contractor with the required field changes. This situation leads to delay and disruption claims or an exorbitant charge by the contractor to modify the equipment to the required configuration.
11. Cost Control of GFE is usually under the control of the organizational functional managers. At the start of a new program, the program manager budgets the total end cost of the shipbuilding program to include cost estimates submitted by the functional managers for the Government-furnished equipments. Many times, actual costs incurred by the functional managers exceeds by wide margins the original cost estimates putting the shipbuilding program into a cost growth situation. These cost increases are often

identified late in the program life, giving the shipbuilding project manager no lee-way for trade-offs.

SECTION III

Approaches Which Show Promise of Eliminating or Minimizing the Problems

The Navy has in the past several years taken many steps which should minimize future shipbuilding claims in the area of GFE & GFI. This section examines some of the steps which one major shipbuilding program, The Guided Missile Frigate (FFG-7 Class), has taken to reduce the risks associated with GFE and GFI. These steps are typical of approaches which are being applied throughout the Naval Sea Systems Command.

Extended Use of the Land Based Test Site for Combat System Equipment

Some of the most complex systems of modern warships are those associated with the Combat System. These systems normally consist of equipments such as radars, sonars, missile launchers, guns and the fire control system with its associated digital computers and displays. These systems are generally always GFE. All of these systems are physically integrated with each other and their operation is highly dependent on the transfer of data from one equipment to another through the use of digital computers, versus human operators as was done in the past. The need for strict configuration control is para-

mount to maintain the proper functioning of these complex systems. Once a computer software program is developed for a particular configuration, slight variations in the equipment could invalidate that computer software program and render the entire combat system unoperational. The Navy has found the use of the Land Based Test Site to be a valuable tool in the integration, computer software development and testing of shipboard Combat Systems.⁷

The original purpose of the FFG Land Based Test Site was to install and integrate live equipments in simulated shipboard compartments and to develop the computer programs. It served the purpose well, as problems were uncovered and resolved early in the ship design process. If a Land Based Test Site had not been used, correction of these problems would have been time consuming and very costly.

A secondary use will be made of the FFG Land Based Test Site by cycling major combat systems equipments through the facility prior to shipping these equipments, as GFE, to the three shipyards who will be constructing the ships. The purpose of this effort will be to inspect each equipment for the proper configuration, to test each equipment individually and to interconnect all the combat systems equipment and test them as a system against the developed computer programs. The equipment will then be removed from the test stands and held until the required shipment date to each of the shipbuilders.

The alternative of not "grooming" the equipment at the Land Based Test Site would be to have each vendor ship his individual equipment direct to the shipyard without the benefit of an integration test of the system as a whole. Benefits of this approach are summarized below:

- (a) Equipments are tested and groomed as a system under controlled conditions prior to shipment to the shipyard.
- (b) Equipments are stored in environmentally controlled areas and preventative maintenance is performed by skilled people.
- (c) The Government has the flexibility of shipping early to the shipbuilder equipment which is desired early and keeping in safe storage those equipments not needed.
- (d) Equipment is repaired or modified by the government without the necessity to negotiate and execute a contract modification with the shipbuilder.
- (e) The Government can verify that the equipment delivered to the Land Based Test Site agrees with the GFI held by the Shipbuilder and can take appropriate steps early if differences are noted.

Validated Lead Yard Documentation

The FFG program has made provisions for the lead shipbuilder to validate key working drawings and test procedures which will be made available to the follow shipbuilders. The drawings will be checked against the lead ship "as built" and they will be revised if needed. The test procedures will be revised if errors are apparent when conducting the equipment tests on the lead ship. The government will warrant that the

work performed without departure from the validated documentation will meet the Ship Specification requirements.⁸ This validation is scheduled to take place well in advance of the need date by the follow shipbuilder. The benefits from this approach should be a decrease in inaccurate documentation from the lead shipbuilder to the follow shipbuilders.

Cycling of Stock Items Through a Field Activity

Many GFE equipments procured by the functional managers are not procured for the ship under construction per se but are delivered to stocking locations for use by the fleet at large, i.e., operation ships and those under repair or construction. Configuration status accounting is often unsatisfactory for these equipments because they are often built by different vendors, under different contracts and are, therefore, slightly different models. Current required field changes are often not incorporated. Another problem is that many times the program manager orders an equipment which is listed as available in stock only to find out at the last minute that the item required is in-fact out of stock.

To overcome these problems the FFG shipbuilding program office has engaged a Field Activity to order these stock items early for each FFG class ship under construction. If an equipment is out of stock the functional manager is notified and steps are taken to remedy the situation. Upon delivery of the equipment to the field activity it is inspected for incor-

poration of the required field changes and tested and repaired if needed. The GFI which was delivered earlier to the shipbuilder is verified by the field activity against the actual equipment. If differences are noted, the shipbuilder is notified immediately for the purpose of taking corrective action. Lastly, the equipment is repacked and the containers are marked in such a way that the equipment is easily identified without the need to re-open the container until it is ready for use by the shipbuilder. The equipment for each hull is segregated and upon the due shipment date, one large shipment is made to the shipbuilder. The benefits from this approach are: the government orders early, inspects, modifies, tests and corrects both the GFE and GFI prior to its shipment to the shipyard, thus minimizing claims for increased cost by the shipbuilders.

Procurement of Equipment by the Exercise of Options

In order to achieve the benefits of standard equipment between ships, without supplying such items as GFE to each follow shipbuilder, the FFG program office required the lead shipbuilder to negotiate prices and delivery dates with vendors for about 40 key equipments for the three follow FFG shipbuilders. These were not firm contracts, but were contracts to be exercised at the option of the follow FFG shipbuilders. This concept proved to be successful, because the vendors and the shipbuilders as well as the government, received benefits of standardization and savings due to economic lot size in a competitive

atmosphere. The government also reduced the risks associated with CFE but gained the same advantages as would have been achieved had the equipment been GFE.

Use of mockups prior to equipment installation

Many times during ship construction equipment is installed and damaged due to the construction work still in progress. To eliminate this problem the FFG program will provide to each shipbuilder mockups for most of the equipment which is susceptible to such damage. These mockups will have built into them all required interfaces such as cable connectors, pipe fittings and ventilation ducts. The shipbuilders will hook-up their cables, piping and vents to these mockups in lieu of the actual equipment. When the compartments are substantially complete the shipbuilder will remove the mockups and replace them with the actual equipments. This approach should minimize claims due to defective GFE.

SECTION IV

SUMMARY AND CONCLUSION

When a program manager must make a decision to provide or not provide equipment as GFE to his contractor, he is confronted with several undesirable alternatives. If he decides to provide the equipment as GFE he assumes the risks associated with late delivery or defective equipment and technical data. If he doesn't provide certain equipments as GFE he may lose the required standardization, or incur additional costs due to his contractor's inability to buy equipments in economic lot sizes.

If his organization utilizes the matrix form of management his GFE is usually procured by the functional managers, thus, compounding his dilemma because, while he still has the responsibility for delivery of his program on time, within costs, and to the stated specifications, his authority to make decisions and tradeoffs in the area of GFE is limited.

Recent recognition of the GFE problem by OSD will likely lead to steps which will increase emphasis on GFE management, but attempts to increase the authority that the program manager will have over the functional organization will probably not succeed because of the increased resources required, dilution of technical specialization, and the loss of "corporate memory" when the Program Management office is terminated.

The program manager must take the initiative to insure that risks associated with GFE are minimized because ultimately the responsibility is his alone to insure that the total program is on time, within cost, and satisfies the Specifications. The approaches presented in this report are examples of what can be done in this area.

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STUDY TITLE:

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SHIPBUILDING CONTRACTS.

STUDY PROJECT GOALS:

To understand the problems encountered when the Project Manager decides to provide an equipment as Government Furnished Equipment (GFE) and to investigate alternate approaches which could substantially reduce contractual risks associated with GFE.

STUDY REPORT ABSTRACT:

This report examines the reasons why GFE is used; the obligation the government assumes when GFE is used; the typical problems encountered by the Project Manager when GFE is used; and offers some proposed approaches which show promise of eliminating or minimizing the problems associated with GFE.

KEY WORDS: GFE Dilemmas

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SHIPBUILDING
PROGRAM MANAGEMENT

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